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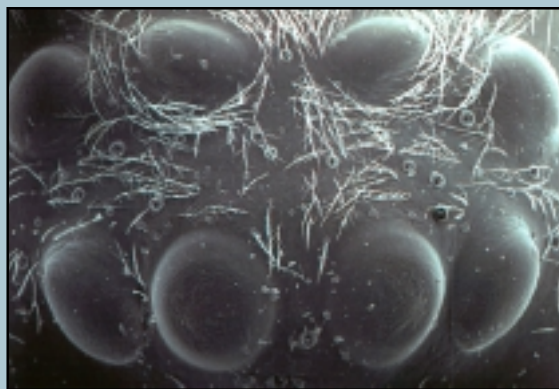
WRIGHT-PATTERSON AFB, OHIO — "What's the smallest thing you've ever seen? Anything students tell us about, we can top it. We can show them something smaller!"

That's how Eric Pooler, a third-year engineering-physics major at Wright State University and research assistant at the Air Force Research Laboratory's Materials and Manufacturing directorate here, describes a unique program at the directorate. This school year's program, once more, has placed area students at the controls of

some of the world's most powerful scanning electron microscopes.

Initiated in 1990, the Scanning Electron Microscope Educators, or SEMEDS, program attracts up to 400 students annually, providing on-the-spot experience with a technology they previously could only read about. During this school year, 353 students from 18 schools around the Miami Valley have gone through the formal SEMEDS program; an additional 200 students received hands-on experience with the microscopes

(SEE MICROSCOPE/P.5)



SEEING THINGS — This is a close up view of a spider's eye as seen by students participating in the Scanning Electron Microscope Educators Program. The program is sponsored by the Materials and Manufacturing directorate of the Air Force Research Laboratory.

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<http://intra.afrl.af.mil/news>

Top scientist previews munitions during Eglin visit

by Bill Thornton, Munitions directorate

EGLIN AFB, FLA. — The Air Force Chief Scientist Dr. Daniel E. Hastings visited Air Force Research Laboratory's Munitions directorate recently. The visit brought him up to date on weapon technology developments during the past few years.

Hastings received information about the Small Smart Bomb and the low-cost Autonomous Attack System. He also participated in several unique hands-on testing operations. At the Advanced Warhead Experimentation Facility, Hastings witnessed the detonation of a new explosive formulation called MNX-777.

His visit to the Fuze Experimentation Facility was not quite as noisy. There, he assisted technicians gathering penetration information when he fired a 105mm Howitzer and test-fired the "Barrett" .50 caliber rifle.

"These are old, but useful tools in our business," said Walt Maine, ordnance division chief. "These guns are used as launchers for experimental warheads and sub-scale projectiles.

"Our scientists record each shot and are able to analyze how the projectile penetrated the target. Not many people associate an Army Howitzer with developing air-delivered weapon concepts. Dr. Hastings was surprised when he saw Army artillery on an Air Force base. But, when we explained its purpose and how it was being used, he understood."

According to Dr. Robert Sierakowski, Munitions directorate chief scientist, "Dr. Hastings' tour of our facilities also gave him the opportunity to gain first-hand insights into the wide range of experimentation and research capabilities that we have here on Eglin, as well as of our past accomplishments."

Hastings serves as chief scientific adviser to the Air Force chief of staff and the secretary of the Air Force. He provides assessments on a wide range of scientific and technical issues affecting the Air Force mission. @

Find additional Features on the web.....

Test sites saves Air Force millions, helps environment

Enthusiasm sprouts 'growth' at AFRL research site

3-D scanner gives troops perfect-fitting uniforms

Ultra-thin nickel-based castings improve engines

Advanced modular factory manufacturing speeds up delivery

by Fred Coleman, Materials and Manufacturing directorate

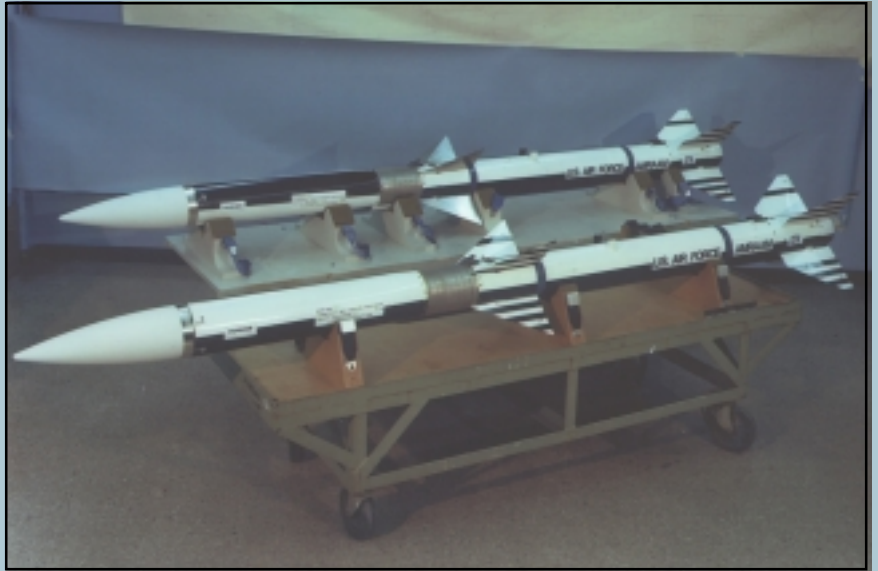
WRIGHT-PATTERSON AFB, OHIO — The missile age began in the 1940s when Germany began to drop these powerful weapons on their adversaries. Since then, the fate of this widely used weapon has depended on how quickly it can reach a target. However, it also depends on how quickly the manufacturer can get the missile to the warfighter.

“The recent conflict in Kosovo pointed out very clearly the importance of getting missiles to the warfighter in a timely manner,” said Brench Boden, project manager of the advanced modular factory contract.

To meet the demand for these war-fighting tools, Raytheon Missile Systems and the Materials and Manufacturing directorate have created advanced methods of moving these products from the manufacturer to the consumer.

Researchers demonstrated an advanced modular factory, or AMF, approach to manufacturing by identifying high-payoff changes at production facilities and effectively demonstrating world-class quality manufacturing. These changes resulted in reduced inventory, cycle time, material handling and warranty costs, and generated a 40 percent reduction in the time required to fill orders for the advanced medium range air-to-air missile.

Using the new approach, engineers at RMS and the directorate were able to: establish models and simulations that allow a concise understanding and evaluation of the flow process; reduce set-up times; implement process owner inspections throughout the value chain; strive for single-piece flow; minimize the space used and distance traveled by personnel and material; and synchronize production and delivery in the value chain.



DROPPING BOMBS ON HIGH ORDER FULFILMENT TIME — Raytheon, under contract to the Materials and Manufacturing directorate, has successfully demonstrated cost-effective ways for improving tactic missile delivery programs by targeting specific production facilities and identifying high-pay-off changes. This has significantly reduced the order fulfillment time for air-to-air missiles.

The research team also eliminated critical path waste, and lead time, internal/external cycle times and inventory levels. They increased inventory turns, quality and financial performance.

RMS also developed a technology transfer methodology to help other organizations use AMF and lean improvement processes and metrics.

Continuing efforts in this area could lead to substantial savings for the Air Force and more rapid delivery times for other missile programs. @

AFRL researchers assist school's solar bike racing team

by Karen Katzenbach, Aeronautical Systems Center

WRIGHT-PATTERSON AFB, OHIO — For the third consecutive year, students from Dayton's Patterson Career Center competed in the May Solar Bike Rayce USA in Topeka, Kan. The Patterson team was helped in its efforts by researchers at the Air Force Research Laboratory.

Robert Kaiser, a drafting teacher at Patterson and team coordinator, found out about the competition at a 1996 meeting of the Wright Site educational outreach program.

“When I heard about it, I said, ‘This is something my kids could do,’” Kaiser said.

The race features teams of four competing with solar panels and batteries which provide extra propulsion power to assist the rider.

Despite their determination, the Patterson team knew they

needed a little help and entered into a partnership with the AFRL.

In preparation for the 1997 race, lab officials put Kaiser in contact with NASA-Glenn experts who helped the team obtain solar panels for the bike.

In 1998, the Patterson team took first place in the competition that consists of a 400-meter sprint and a 100-kilometer relay.

This year, researchers at AFRL's Propulsion directorate have advised the team about the type of battery pack the bike should carry.

“They helped us go from carrying a 30-pound battery pack to just a 10-pound pack that is even more powerful,” Kaiser said.

“This shows the real-world application of technology, which is great for these kids to see.” @

Tests answer color-fading questions

by Bobbie Mixon Jr., Aeronautical Systems Center

WRIGHT-PATTERSON AFB, OHIO — They say a picture is worth a thousand words. But when that picture is composed of kaleidoscopic color images on a fighter aircraft's cockpit display, its details can become difficult to discern as a pilot pulls higher and higher G's, especially when the picture's colors keep changing.

According to Air Force research, increased G forces can cause eye-level blood pressure to drop and color vision to fade, dramatically altering the perception of the picture before a pilot, and potentially disrupting the pilot's ability to discern informational cues on the cockpit's display. That's why scientists here at the Air Force Research Laboratory have been using the Dynamic Environment Simulator, a man-rated, three-axis centrifuge, to investigate why colors fade at high G and whether a pilot's performance is affected by such fading.

For years, researchers have known about the effects on eyesight of "gray out" and blackout associated with the collapse of peripheral vision at high G's, but traditional green and black, monochrome displays presented few color-related performance problems during these episodes due to the absence of color-coded information. Advances in display technology, however, have resulted in more vibrant cockpit indicators, making questions related to color vision more relevant.

The answers are useful to military aviators because pilots depend on the ability to discern and identify colors when performing many cockpit tasks, such as reading a moving map display, or understanding threat-warning and situational indicators.

According to Dr. Tamara Chelette, a biomedical engineer heading the color study for AFRL's Human Effectiveness directorate, some results are in.

"At high G, the eye tends to first lose cyan, a light blue color, while yellow and green tend to blend together and become indistinguishable."

Researchers have determined that the loss of color vision is caused by the luminance contrast used to display a particular hue.

"Luminance is an objective measure that relates to the human perception of brightness,"

(SEE COLOR/P.5)



SHOW AND TELL — Rich Garcia, from the Directed Energy directorate at Kirtland Air Force Base, N.M., demonstrates a model of a 50-foot-diameter thin-membrane space mirror to one of the visitors to the Air Force exhibit at the Paris Air Show.

Representatives from directorates participate in Paris Air Show

Reported by Directed Energy directorate

PARIS — The United States Air Force's space program, from the 1940s to the future, was highlighted in June at the Paris Air Show, the largest and oldest event of its kind in the world.

Showcased in four areas, the educational exhibit was among nearly 1,800 available to an estimated 300,000 visitors over the eight-day show.

According to Anne Johnson-Sachs, exhibit team leader from the Air Force History and Museums Program in Washington, D.C., "Our exhibit chronicles more than 50 years of Air Force accomplishments in space — from the earliest concept developments to the current integrated air and space collaborations."

Called "Visions of the High Frontier," the booth featured historical photographs that highlight some of the major milestones in the U.S. Air Force space program. A variety of handouts and more than a dozen pamphlets and publications were available for visitors wanting in-depth information.

Representatives from the Air Force Research Laboratory's Directed Energy and Space Vehicles directorates were on hand to discuss current space technologies. Also present, to explain a variety of other key Air Force activities, were people from Air Force Space Command at Peterson AFB, Colo., and the Air Armament Center at Eglin AFB, Fla.

In a nearby gathering area, the team assembled 30 pieces of original art from the United States Air Force Art Collection. The works, which include oil paintings, sketches and mixed media, represent some of the world's best space art.

In addition to the main display and the art collection were two satellite areas: one hosted by Col. Delbert Terrill, author of *Outer Space Law*, who provided copies of his book and discussed the intricacies of space law. The other display area consisted of a series of panels on the Air Force Space Warfare Center at Schriever AFB, Colo. The panels described the center's space mission and significant projects.

Located in the United States national pavilion, these displays were the result of a collaborate arrangement with American Aerospace Defense Industries, Inc., and the U.S. Department of Commerce. @

Microscope (from page 1)

during special events and tours.

Both students and teachers gain real-world experience operating the "super" microscopes, capable of enlarging objects up to 200,000 times their normal size, Pooler said. They're also given an opportunity to meet and interact with working scientists in a real-world laboratory setting.

"The microscopic world provides a different scale for looking at things," Pooler said.

He should know; he participated in the program as a senior at Centerville High School in 1996, and currently serves as a SEMEDS volunteer instructor when he's not assisting in laser experiments in the directorate's new Ultrafast Physics Laboratory or attending classes.

When the students arrive, they are briefed on the directorate's mission, introduced to the volunteer instructors for that session, then divided into groups and given hands-on experience operating the microscopes. The scanning electron microscopes enable them to explore a variety of interesting specimens, including bee stingers, computer chips, compact discs, coins, human hair and spiders, all of which take on mesmerizing characteristics at the higher magnifications.

"SEMEDS places science in front of students and provides something they can physically see and manipulate," Pooler said. "It gives students an opportunity to use a sophisticated piece of equipment and to look at something that has genuine research value. The world is more than you see. There's a lot going on; you just don't see it."

The SEMEDS program was created by Dr. Wade Adams, chief scientist of the directorate, and Dr. Al Jackson, a research scientist in the directorate's Materials Process Design Branch. The program is offered after duty hours, four times a month and is designed to accommodate 18 students a session.

Materials researchers like Pooler, working with the Wright-Patt Educational Outreach Office, have donated several thousands of hours of their own time during the past eight years working with the students. Their efforts have been applauded by the Dayton-area teachers and schools involved in the program and also have



THE HANDS ON APPROACH — During the last school year 353 students from 18 schools around Miami Valley, Ohio, experienced the SEMEDS program. Two-hundred other students got their chance to use the microscopes during special events and tours at the Materials and Manufacturing directorate.

spawned several spin-off programs at local universities and scientific organizations, said Katie Thorp, an engineer in the directorate's Nonmetallic Materials Division and one of the SEMEDS program's chief administrators.

"The SEMEDS program exposes the next generation to science, and engineers and scientists in their working environment. It also provides role models and ideas to students who are nearing critical decision points about where they would like to go in life, their careers and education," Thorp said.

"The program is for any student because exposure to research is the nature of how new ideas are brought about," Pooler said. "SEMEDS is a perfect example of that. I think the individuals who organized the program have put a lot of work into it. They're very dedicated to what they are doing."

For more information on the SEMEDS program, contact Katie Thorp at (937) 255-1138; Marc Martin at (937) 255-3808, ext. 3166; or Suzanne Bertke at the Educational Outreach Office at (937) 253-7125. @

Color (from page 4)

said Dr. David Post, a human factors engineer and color expert for AFRL. Luminance contrast, a ratio of two luminances, measures how well something stands out against its background.

"We found that the color-fading effect is directly related to a color's luminance contrast" said Post, who co-investigated the study. "Specifically, the lower a

color's contrast, the more vulnerable it is to fading under G."

Understanding these effects and the role of display limitations will be important to designers of aircraft cockpit symbology, who use standardized computer symbols and situational indicators. Typically, red symbols identify an enemy, green a friend and yellow an unknown.

Testing has shown that color-coded information in the cockpit improves

reaction times and decreases error rates, making the use of multicolored displays more likely in future aircraft, Chelette said.

An Air Force technical report will be created based on these color-vision tests for use by other researchers, military flight surgeons and industry. The technical report on the color vision research, begun in September 1998, is scheduled for publication this fall. @

C^aolumns

Commander's Corner

Technology results in success for Allied Force



by Maj. Gen. Paul

The Air Force participants in Operation Allied Force are being recognized at a special ceremony in Washington, D.C., this month, so it's most appropriate and timely for me to recognize you at this time.

Many people would tend to overlook the contributions our people make to the warfighter. But as is pointed out on the web version of this newsletter, your efforts were critical to the success of our operations in Kosovo.

I want to let you know how proud I am of your efforts during Operation Allied Force, and I extend my sincere thanks to you in all your hard work and for representing our organization in your typically outstanding manner.

Please accept my personal thanks to all who were involved in this critical operation. In particular, I would like to thank those who were deployed and most actively involved. Those who directly participate in any operation personally take on the extra burdens associated with

separation from family and working in hostile environments and are rarely thanked enough. I would also like to thank those who

worked science and technology projects that directly applied to successes in Operation Allied Force. These included providing Logistician's Contingency Assessment Tools, Joint Targeting Workstations, All-purpose Remote Transport Systems, Night Vision Imaging System Compatible Cockpit Lighting, Broadsword and many more technologies.

AFRL expertly implemented many more exceptional technologies prior to and during Operation Allied Force, and I'd like to say "Bravo" to each and every participant.

Once again, let me stress how critical your contributions were to Operation Allied Force. It should be obvious that the scientific research you do provides the technology foundation for the success of our Air Force. Please accept my personal thanks for another job well done!

I would like to thank those who worked on science and technology projects that directly applied successes in Operation Allied Force...Logistician's Contingency Assessment Tools, Joint Targeting Workstations, All-purpose Remote Transport Systems, Night Vision Imaging System Compatible Cockpit Lighting, Broadsword and many more technologies.

C^aolumns

PA Pointers

'It's on the Internet' doesn't make it true

by John D. Banusiewicz, Defense Information School

Some time after TWA Flight 800 went down off Long Island, N.Y., in July of 1996, journalist Pierre Salinger damaged his credibility, perhaps irreparably, by claiming to have a "secret government document" that proved the U.S. Navy shot the airliner out of the sky. As it turned out, his document was nothing more than a letter, written by an airline pilot, that had been circulating freely on the Internet for months.

Perhaps sensing his credibility could only be restored if his allegation proved to be true, Salinger apparently had no choice but to further embarrass himself by hooking up with a gang of professional conspiracy theorists to put together a report that was wholly refuted by the government and widely ridiculed for its shabbiness by professional news organizations.

No babe in the woods, Salinger was President Kennedy's press secretary and worked for ABC News for many years thereafter. But if a heavy hitter like that can fall victim to believing something because he found it on the Internet, what about the relative neophytes who are military journalists?

The World Wide Web can be a great research tool but, like any tool, it can be dangerous in the hands of someone who doesn't know how to use it correctly. Journalists being burned by using questionable source material without cross-checking it is nothing new. But the Internet makes it easier than ever for anyone to "publish" anything, so it has exponentially expanded the body of questionable source material that's out there. It's easy for a sloppy researcher or someone with an ax to grind to package bad information well, thus giving it the appearance of being credible. When we did most of our research using printed sources, source credibility was easier to establish because it was harder for purveyors of nonsense to reach the mass market. That's not the case any more.

Put some healthy skepticism to work. This is a good habit to develop.

Of course, the best defense against getting bad information from the web is to stick with sites you'd expect to be credible and to verify information you plan to use by visiting other credible sites or using more traditional means. @

(Banusiewicz is the Editors Course coordinator at the Defense Information School, Fort George G. Meade, Md.)

Internet sources — how to find out who's behind them

Journalists and researchers have always had to check their sources. This rule is easy to forget while speeding across cyberspace, especially when the information we encounter looks and sounds professional. While it takes several resources to create a professional-looking book, newspaper or magazine, an open phone line, a few clicks of the mouse and taps on the keyboard will create a forum for pranksters and those who are misinformed.

There are a few things to keep in mind before trusting information you find on the World Wide Web. Look up the source behind the site — everyone who owns a domain has to register it with a Network Information Center, or NIC, for the domain to be reachable. Fortunately, this data is publicly available. All a researcher has to do is go to the relevant NIC and type in the domain name.

For all ".com" addresses, one can look up names at <http://www.networksolutions.com/cgi-bin/whois/whois>. For all other domain names try <http://www.allwhois.com>. The address, name, etc., of the site owner may give you specific clues as to the site's reliability. For example, if you read this on the Internet and wanted to verify its truth, the owner of the domain would be Air Force Research Laboratory. If the owner was Kermit the Frog at Sesame Street, you may want to look elsewhere for your information. You are typically given enough information by the NIC to look up the owner's name in the phone book and solicit answers to any additional questions.

There is also a small, free program called "Alexa" that will display the information one would find at the aforementioned sites at the bottom of your display screen. If interested, visit <http://www.alexa.com> to download the program.



@Columns

CIO Topics

Viruses and hoaxes; be on the lookout



Office culture these days lends itself to camaraderie and close quarters. This gives many of us such a sense of security that it is easy to forget that Internet terrorism goes on. Sometimes simply running a program that is attached to an e-

mail message could initiate a virus that wreaks havoc on a computer's internal functions and may render office hardware useless. It is important to be familiar with the types of problems that are associated with these viruses and any warning signs that could prevent computer systems from becoming infected.

We have seen terrorism in recent months with the Melissa virus, among others. The Melissa virus affected machines with certain Word 97 or Word 2000 programs. Melissa was sent as an e-mail with the subject line, "Important Message From [name]." When the Word attachment that accompanied the e-mail was opened, the virus lowered the macro security settings to permit all macros to run when future documents were opened. Therefore, the user would not be notified when the virus was automatically executed on the hard drive.

In some cases, the virus propagated itself by sending the same initial message to the first 50 people on an infected computer's address book. If one of the first 50 was a mailing list, everyone on the list would get the message. This virus specifically targeted computers that used Microsoft Outlook. In other cases, it modified and damaged Word documents already saved to a piece of hardware.

In a short time, Melissa was able to tie up mail servers and significantly damage computer systems around the country.

Aside from the obvious problems these viruses have created, a lesser-known problem also accompanies this phenomenon – virus hoaxes. Sooner or later you may get an e-mail warning you not to open an e-mail with the subject line "Good Times," "AOL4Free" or "Penpal Greetings" because they contain a virus.

These e-mail warnings tell you that an e-mail (without any attachments) a user received is specially encoded with a virus that will destroy hardware from the inside out.

The fact is you cannot get a virus by merely opening an e-mail message alone. An e-mail message is just plain text and contains no code. This means that it cannot do anything detrimental to a user's system.

The practice that makes these hoaxes damaging to the internal functions of government and business offices is the last line of the e-mail message that tells the reader to "send the message to all of your friends." The fear generated by these hoax e-mail messages results in mass chain mail. The Melissa virus automatically generates 50 e-mail messages to people stored on a computer address book. A user is doing the same amount of damage *willingly* if they forward these hoax e-mails to several friends.

If you receive an e-mail like this, there is a net index of Computer Incident Advisory Capability at the U.S. Department of Energy that will help you determine its validity. This index is located at <http://ciac.llnl.gov/ciac/CIACHoaxes.html>.

Another common myth is that the JPEG or GIF pictures attached to an e-mail can contain viruses. This is not true.

The files that can contain viruses are attached to an e-mail (i.e. programs, Word documents, etc.), not pictures. But even these viruses cannot infect your computer when you simply download or open mail. The only way for them to infect your computer is if you purposely run the attached program or open an infected Word document.

Knowing this, there are a few steps one can take to eliminate the problems associated with viruses. First, pay attention to all e-mails that have attachments. If a sender is not someone familiar to you it may be wise to report this to the Corporate Information Office rather than to open it and risk activating a virus. If you know the sender, but were not expecting anything from him or her or if the e-mail was sent at an unusual time (i.e. 2:00 a.m.), be wary of it.

Similarly, if you receive a virus hoax, contact your computer system security officer *before* passing the virus warning on to anyone else. These hoaxes operate like a chain letter and merely waste time and create an unnecessary panic. The information will be forwarded to the Air Force Computer Emergency Response Team, or AFCERT, for verification. If the information turns out to be accurate the team will work with the major anti-virus companies to ensure a fix or "fix patch" is produced to counteract the virus. Because of proactive response by Air Force Materiel Command Headquarters and all Air Force Research Laboratory system administrators, the effected downtime of Melissa was measured in hours instead of days, unlike the problems experienced by some major corporations.

A little bit of caution can save you and your colleagues an immense amount of time and energy. @

TD Spotlight--

Directed Energy directorate

by Rich Garcia, Directed Energy directorate

KIRTLAND AIR FORCE BASE, N.M. — Perhaps it's too simple to say that they take exotic gadgets, like lasers, and turn them into something that could ruin the other guy's day. But, to some extent, that's what the more than 600 men and women who work at the Air Force Research Laboratory's Directed Energy directorate do.

Creating more than just lasers, these scientists and engineers work on plasma projectiles, "air cannons," high-energy microwave technologies, large space-based optics, and sophisticated laser-based sensors on massive telescopes, aboard aircraft and spacecraft.

"We've been working on directed energy technologies for more than 20 years," Dr. Earl Good, head of the \$135-million-a-year directorate said. "Our research is now starting to gain widespread understanding and acceptance, with warfighters beginning to grasp what

these technologies can do on the battlefield."

Reflecting some of this interest are two major directorate studies chaired by senior Air Force leadership: Retired Air Force Chief of Staff Gen. Ronald R. Fogleman headed a study that examined how directed energies could be applied in tactical airborne combat. Retired Air Force General John L. Piotrowski took charge of another study aimed at evaluating how laser and optical systems might be used in future space systems. For both of these, the directorate worked closely with potential users in Space Command, Air Force Special Operations Command, the Army and Navy.

The near-term value of directed energy weapons is best illustrated in the Airborne Laser, a project that grew out of the directorate and is now looked at as the Air Force's number one technology program. Within ten years, the Air Force



I WISH I MAY, I WISH I MIGHT — A laser streaking spaceward from Starfire Optical Range senses atmospheric distortions. The Directed Energy directorate pioneered technologies for using a laser and deformable optics to sense and correct for these distortions so that objects in space can be seen more clearly.



FIRE IN THE SKY — An artist concept depicts the Airborne Laser, the Air Force's number one technology program. This system uses an aircraft-mounted laser to destroy Scud-like missiles hundreds of miles away. The Directed Energy directorate invented the laser that is being used on the aircraft as well as the technologies for correcting for range-limiting distortions in the atmosphere. The directorate continues to work closely with the Airborne Laser System Program office on the Project.

intends to have a seven-aircraft fleet of laser-carrying jumbo jets. Carrying a chemical laser invented by directorate scientists, the Airborne Laser will be able to destroy attacking Scud-like missiles from hundreds of miles away.

The directorate continues to work on Airborne Laser follow-on programs. These include an all-gaseous chemical laser and an inexpensive liquid crystal-based technology that can correct for atmospheric distortions which would otherwise limit the effectiveness of the laser. A new laser site was recently opened at White Sands (N.M.) Missile Range to evaluate and improve the effectiveness of the Airborne Laser.

Other directorate researchers operate

(SEE ENERGY/PG.10)

Energy

(continued from page 9)

the two largest telescopes in the Department of Defense. Although not astronomers, they use these telescopes to develop ways to “see” things in space more clearly. This is a critical need for those who try to figure out what different satellites are doing.

Other directorate scientists are creating plasmas – the super-hot, gaseous atmosphere of stars – to see how plasmas might be used as defensive systems in the distant future. Another exotic energy form being examined involves high-energy microwaves that could disrupt electronics. While computers make weapons smart, high-power microwaves can make weapons dumb again.

As the Air Force moves closer to being a space force, directorate researchers are applying their skills and experience in directed energy to space-related systems.

For example, placing large optics in space is vital to the movement of laser energy from the ground to space and from one area of space to another. Work in this area is not being done in a vacuum (no pun intended). Aside from working closely with NASA, directorate scientists are involving two of the laboratory’s directorates. At Wright-Patterson AFB, Ohio, mirror coatings are being developed by the Materials and Manufacturing directorate and sensors by the Sensors directorate. Also being developed are large, lightweight structures by the Space Vehicles directorate, a sister directorate here. Funding for the basic research that is needed to grow these technologies is provided by the laboratory’s Office of Scientific Research in the Washington D.C. area. It truly is an integrated



HANGING OUT — An F-16 fighter is suspended in a large anechoic chamber where it can be evaluated against the effects of high-energy microwaves. The Directed Energy directorate is conducting research on microwaves and their effects on Air Force systems.

AFRL approach.

Putting a large mirror in space, using this country’s current rocket boosters, is a Herculean challenge. An inventive alternative seeks to use a thin film of plastic that can be rolled up in the launch vehicle and popped out in space to make a large mirror. A high-quality, “solid” surface can be made by using a series of techniques to correct for any imperfections in the mirror surface.

In other ways to use lasers, directorate technologists have developed a means to fire two laser beams into man-made clouds (chemical weapons or discharges from manufacturing plants) and compare the two beams to identify what chemicals are present. A variation of this technology was used overseas to build a laser “fence” that would provide warning to our troops of a hazardous agent attack. Lasers can also be used to look through camouflage. Because light reflects differently from various materials, short-pulsed lasers could be used to penetrate through the camouflage to tell us what is beneath.

“Lasers work at the speed of light and are not constrained by gravity,” Good said. “They can be very focused – precise in their application – providing the warfighter with a graduated means of delivering energy. In this age of concerns over collateral damage, directed energy weapons have the ability to be very precise – surgical.”

The Directed Energy directorate handles about 95 percent of DoD’s money in directed energy. Based on results coming from the directorate’s military, civilian employees and contractors, this trend is expected to continue as directed energies become the future of the Air Force. @

For more information about this directorate, visit its web site at <http://www.de.afrl.af.mil>.



IT’S A BIRD, IT’S A PLANE...NO, IT’S — A specially modified flying laboratory called Argus (for the mythological creature of 100 eyes) gathers information from eleven different sensor platforms. Argus supports many of the Directed Energy directorate’s research programs.

Net Index

Due to the number of submissions we receive, some sections of *news@afrl* are available exclusively on-line. The on-line version of the newsletter allows users to view the AFRL corporate calendar, news releases generated by AFRL headquarters, operating instructions, L@b L@urels and Roundups sections.

The L@b L@urels section of the electronic newsletter is dedicated to members of Air Force Research Laboratory who receive awards and honors. The Roundups section of the electronic newsletter keeps Air Force Research laboratory employees informed about contracts AFRL has awarded. Below is an index of articles one can find in each of these on-line sections.

L@b L@urels

- Romar named non-commissioned officer of year



SSgt. Gerald Romar

- AFMC's outstanding technician is from Munitions
- Munitions scientist wins equal employment award
- Munitions scientist snatches tech transfer award
- Norelli receives Air Force small business award
- Rudd receives award for fatigue and fracture work
- Propulsion researcher matches wits with greats
- George Washington University honors scientist
- *CIO* magazine honors directorate's web site
- Information directorate officers win reservist awards
- Knowledge and courtesy land award for LMCA team

Roundups

- AFRL awards contract for forensic software tool
- Protecting large computer networks is contract goal
- Global network simulator the target of AFRL contract
- Contract to improve analog-to-digital processing
- AFRL awards contract to thwart computer intrusions
- Directorate finds support for intelligence division
- Contract to improve fusion of computer data
- Software to transfer data between security levels
- Kestrel to advance computer system environments
- Air Force, industry join to produce multi-role laser
- Research to improve radar signal processing
- Speed and of battlefield information to improve
- Universities garner grants, contracts and agreements

To view the full text of these and other articles visit the *news@afrl* page on the Intranet.

To submit L@b L@urels or Roundups from your directorate, send a query to:

Timothy.Anderl@afrl.af.mil